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ZIOLKOWSKI PATENT SOLUTIONS GROUP, SC (GEMS)
14135 NORTH CEDARBURG ROAD
MEQUON, WI 53097

EXAMINER	
FETZNER, TIFFANY A	

ART UNIT	PAPER NUMBER
2859	

DATE MAILED: 06/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/707,433	PETERS, ROBERT D.
	Examiner	Art Unit
	Tiffany A. Fetzner	2859

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 December 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 March 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED 2nd Non-FINAL ACTION

Information Disclosure Statement

1. The information disclosure statement (IDS) submitted on 12/22/2003 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the examiner has considered the information disclosure statement, and the initialed and dated IDS is attached to this office action.

Drawings

2. The drawings filed 03/28/2005 have been approved by the Official Draftsperson; see the attached PTO 949 Form.

Response to Arguments

3. Applicant's arguments, see The Remarks, filed 03/24/2005, with respect to **Kuhara** have been fully considered and are persuasive. The earlier rejections based on the prior art reference of **Kuhara** has been withdrawn.

4. All of the other rejections from the last office action have also been withdrawn in view of the following new rejections, which based on applicant's arguments and a review of the prior art better teach the limitations of applicant's claims.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. **Claims 1-26** are rejected under **35 U.S.C. 102(b)** as being anticipated by **Liu et al.,** US patent 5,621,321 issued April 15th 1997.

7. With respect to **Claim 1**, **Liu et al.,** teaches and shows "A method comprising the steps of: acquiring MR data from multiple echoes in an echo train with a fast spin echo pulse sequence;" [See **Liu et al.,** col. 5 lines 4-10; col. 1 lines 6-16; Figures 1, 2, 5, 7, 8, and 9] **Liu et al.,** also teaches and shows "correcting for amplitude modulation effects" [See col. 6 line 1 through col. 13 line 67; especially col. 9 line 63 through col. 10 line 6; col. 6 lines 1-24 and col. 12 lines 4-40 where T2 signal decay intensity variation from

echo-to-echo is an amplitude modulation effect corrected for by implementing the phase and amplitude corrections to the obtained/acquired echo signals prior to reconstruction of a resulting image via intensity correction circuit 90, magnitude correction circuit 92, and phase correction circuit 80] in the fast spin echo pulse sequence after data acquisition" of each data line. [See col. 6 line 1 through col. 13 line 67, figures 1, 6]

8. With respect to **Claim 19**, **Liu et al.,** teaches and/or shows "A computer readable storage medium" [See **Liu et al.,** the memory circuits of **figure 1** the memory arrays of Figure 1 within: each of array processor 72, intensity correction circuit 90, and magnitude correction circuit 92, and the phase correction vector determining circuit.] **Liu et al.,** uses computer sequence controller 40 of **figure 1** which **has** "a computer program" (i.e. an algorithm as in col. 3 line 38) "to execute a fast Spin echo pulse sequence stored thereon and representing a set of instructions that when executed by a computer causes the computer to: acquire non-phase encoded MR data;" [See **Liu et al.,** col. 6 lines 48-53, col. 10 lines 65-67; col. 13 lines 34-60] "and modify the phase encoded MR data by the non-phase encoded MR data to correct amplitude modulation between the multiple echoes" [See **Liu et al**., col. 2 line 23 through col. 13 line 67.] The Examiner notes that an array(s) of stored data (i.e. acquired signal data, and correction data for amplitude and phase correction) is/are the computer memory version of a data table, as suggested by figures 4, 7, and 9, and comprises at least one "table of amplitude modulation correction values". Additionally, **Liu et al**., teaches "applying at least a portion of the table to the acquired MR data." [See col. 9 line 63 through col. 13 line 60.]

9. With respect to **Amended Claim 2**, **Liu et al**., teaches and shows "the steps of: acquiring at least one set of reference MR data;" (i.e. the non phase-encoded data acquisition sequence used to correct errors in the imaging sequence with phase encoding.) [See **Liu et al.,** col. 6 lines 48-53, col. 10 lines 65-67; col. 13 lines 34-60] **Liu et al**., also teaches "determining a table of amplitude modulation correction values;" because **Liu et al**., teaches storing in memory amplitude and phase data used to correct the acquired magnetic resonance echo signals. " [See **Liu et al**., col. 2 line 23 through col. 13 line 67.] The Examiner notes that an array(s) of stored data (i.e.

acquired signal data, and correction data for amplitude and phase correction) is/are the computer memory version of a data table, as suggested by figures 4, 7, and 9, and comprises at least one "table of amplitude modulation correction values". Additionally, **Liu et al**., teaches "applying at least a portion of the table to the acquired MR data." [See col. 9 line 63 through col. 13 line 60.] The same reasons for rejection, that apply to **claim 1** also apply to **claim 2** and need not be reiterated.

10. With respect to **Claim 3**, **Liu et al**., teaches "acquiring at least one set of reference MR data before" [See col. 13 lines 57-59, col. 10 lines 63-67] "and after acquisition of the MR data" [See col. 13 lines 57-59; col. 10 lines 63-67] The same reasons for rejection, that apply to **claims 1, 2** also apply to **claim 3** and need not be reiterated.

11. With respect to **Amended Claim 4**, **Liu et al**., teaches "acquiring at least one set of reference MR data before acquisition of the MR data" [See col. 13 lines 57-59; col. 10 lines 63-67] "and acquiring a second portion" (i.e. intermixing) "of the at least one set of reference MR data after acquisition of the MR data" [See col. 13 lines 57-59; col. 10 lines 63-67] The same reasons for rejection, that apply to **claims 1, 2, 3** also apply to **claim 4** and need not be reiterated.

12. With respect to **Claim 5**, **Liu et al**., teaches and shows that "at least one set of reference MR data includes non-phase encoded data." (i.e. the non phase-encoded calibration sequence used to correct errors in the imaging sequence with phase encoding turned off.) [See **Liu et al.,** col. 6 lines 48-53, col. 10 lines 65-67; col. 13 lines 34-60] The same reasons for rejection, that apply to **claims 1, 2** also apply to **claim 5** and need not be reiterated.

13. With respect to **Claim 6**, the **Liu et al**., equations of col. 8 line 21 through col. 13 line 60 in combination with figures 1 through 9 and col. 5 line 43 through col. 8 line 20 with respect to k-space and individual data line views teach and show the step of "multiplying each k-space view" (i.e. each echo signal) "of the acquired MR data by a correction value in a corresponding ky location in the table;" [See **Liu et al**., col. 5 line 53 through col. 13 line 60, figures 1 through 9],"and carrying out the steps of multiplying" [See the equations] "prior to transformation of the acquired MR data from k-space to

image space" (i.e. this limitation is equivalent to performing the correction before reconstructing an image) [See **Liu et al.**, col. 5 line 53 through col. 13 line 60, figures 1 through 9],The same reasons for rejection, that apply to **claims 1, 2** also apply to **claim 6** and need not be reiterated.

14. With respect to **Amended Claim 7**, **Liu et al.**, teaches that the "at least one set of reference" (i.e. calibration) "data includes two sets of reference data" because **Liu et al.**, acquires reference(i.e. calibration) data without phase encoding that is split into two separate lines of data which are averaged together [See **Liu et al.**, col. 7 lines 9-34, col. 6 lines 64-67] and "further comprising the steps of averaging the two sets of reference data to determine the table of correction values" [See **Liu et al.**, col. 7 lines 9-34; col. 10 line 63 through col. 13 line 67] The same reasons for rejection, that apply to **claims 1, 2** also apply to **claim 7** and need not be reiterated.

15. With respect to **Claim 8**, and **corresponding claim 22** which respectively depend from **claims 1**, and **19 Liu et al.**, teaches that **"**the at least one set of reference" (i.e. calibration) "data" (i.e the non-phase encoded data) "represents a maximum achievable signal that the acquired phase encoded MR data can attain". [See col. 7 lines 9-25 and the mathematics of col. 8 line 21 through col. 13 line 60.] The same reasons for rejection, that apply to **claims 1, 2, 5, 19,** also apply to **claims 8, 22** and need not be reiterated.

16. With respect to **Claim 9**, **Liu et al.**, teaches that "the MR data is acquired via multiple receiver coils, (i.e. a plurality) "of receiver coils" [See **Liu et al.**, col. 13 lines 52-60 where a phased array of acquisition is taught because a "phased array acquisition" intrinsically requires at least two, but usually more than two receiver coils, therefore a multiple number of receive coils is directly part of a taught "phased array acquisition", **Liu et al.**, also teaches "the steps of correcting for amplitude modulation effects in the MR data from each receiver coil independently." [See the **Liu et al.**, col. 13 lines 52-60 The same reasons for rejection, that apply to **claim 1** also apply to **claim 9** and need not be reiterated.

17. With respect to **Claim 10**, **Liu et al.**, teaches "generating a combined image from corrected image data from each receiver coil." [See the **Liu et al.**, col. 13 lines 52-60].

The same reasons for rejection, that apply to **claims 1, 9** also apply to **claim 10** and need not be reiterated.

18. With respect to **Claim 11**, **Liu et al.**, teaches and shows "An MRI apparatus comprising: a magnetic resonance imaging (MRI) system having a plurality of gradient coils positioned about a bore of a magnet to impress a polarizing magnetic field and an RF transceiver system and an RF switch controlled by a pulse module to transmit RF signals to an RF coil assembly to acquire MR images", [See **Liu et al.**, figure 1, col. 4 line 25 through coll. 5 line 17] "and a computer" (i.e. computer system 107) "programmed to: (A) acquire at least one set of reference MR data;" (i.e. the MR data without phase encoding) "(B) determine a table of amplitude modulation correction values from the reference MR data;" [See **Sandford et al.**, col. 1 line 1 through the entire detailed description. The examiner notes that constructing a table of amplitude correction values is a main point of the entire reference.]

19. Additionally, the examiner notes that **Liu et al.**, teaches that the receivers not only change the amplitude of the acquired NMR signal, but also the time delay imposed on the acquired NMR signal due to a phase angle mismatch of figure 5 which must be normalized to remove artifacts (i.e. smearing, blurring or the misplacement of spin signals along the readout gradient axis, due to T2 signal decay). [See **Liu et al.**, col. 9 line 63 through col. 13 line 60 s 25-32, where the correction data are phase corrected and regridded which indicates that both amplitude and phase information is stored and utilized by the **Liu et al.**, reference. [See col. 6 line 1 through col. 13 line 60, especially col. 6 lines 1-24 where amplitude correction on the acquired data is performed by magnitude correction circuit 92 and intensity correction circuit 90.] The examiner also points out that the amplitude modulation corrections of applicant's specification remove artifacts resulting from T2 decay, [See **Liu et al.**, col. 12 line 4 through col. 13 line 60], therefore the table of correction values for "Amplitude", and phase directly meet the requirements of the claim as supported by applicant's original disclosure.

20. The **Liu et al.**, reference also teaches limitation "(C) acquire MR data;" [See col. 12 lines 40-53] "and (D) modify the acquired set of reference MR data by the table of amplitude modulation correction values". [See **Liu et al.**, col. 6 line 1 through the entire

detailed description of col. 13 line 60]. The examiner notes that constructing a table of amplitude correction values, and correcting the amplitude and time delays in order to remove the amplitude modulation problems of T2 decay and imaging artifacts is a main point of the entire **Liu et al.**, reference.

21. With respect to **Claim 12**, **Liu et al.**, teaches "acquiring the at least one set of reference MR data from one or more discarded acquisitions played out one of prior to and after acquisition of the MR data". [See **Liu et al.**, Figure 9 and col. 8 line 5 through col. 13 line 60.] The same reasons for rejection, that apply to claim **11** also apply to **claim 12** and need not be reiterated.

22. With respect to **Claim 13**, **Liu et al.**, teaches "acquiring portions of the at least one set of reference MR data prior to and after acquisition of the MR data". [See **Liu et al.**, col. 6 lines 63-67, col. 13 lines 52-60.] The same reasons for rejection, that apply to claim **11** also apply to **claim 13** and need not be reiterated.

23. With respect to **Claim 14**, **Liu et al.**, teaches that "the at least one set of reference MR data includes non-phase encoded data" [See **Liu et al.**,. col. 6 line 48 through col. 13 line 60] **Liu et al.**, teaches that "the MR acquired MR data is modified while in k-space" because the amplitude correction occurs prior to the Fourier Transformation which produces the final resulting image(s). [See the entire **Liu et al.**, **al.**, detailed description along with figures 3, 4, 5, 7, and 9.] The examiner also notes that any step that occurs prior to the image producing Fourier Transform occurs necessarily in the intrinsic k-space domain. The same reasons for rejection, that apply to claim **11** also apply to **claim 14** and need not be reiterated.

24. With respect to **Claim 15**, **Liu et al.**, teaches that "the computer is further programmed to acquire the MR data with a fast spin echo pulse sequence." [See **Liu et al.**, col. 5 lines 4-10; col. 1 lines 6-16; Figures 1, 2, 5, 7, 8, and 9] The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 11,** also apply to **claim 15** and need not be reiterated.

25. 16. With respect to **Claim 16**, **Liu et al.**, teaches that "the RF coil assembly includes a phased array" (i.e. a plurality) "of receiver coils" [See **Liu et al.**, col. 13 lines 53-60, which starts with the text "With a phased array acquisition, ..."]. The same

reasons for rejection, that apply to claim **11** also apply to **claim 16** and need not be reiterated.

26. With respect to **Claim 17**, **Liu et al.**, teaches that "the computer is further programmed to carry out acts (A)-(D) independently for each receiver coil" [See **Liu et al.**, col. 13 lines 54-57 where **Liu et al.**, teaches that "The images corresponding to individual coils are reconstructed separately and then combined to produce the final composite image." The same reasons for rejection, that apply to **claims 11, 16** also apply to **claim 17** and need not be reiterated.

27. With respect to **Claim 18**, **Liu et al.**, teaches generating "an image space from the modified MR data." [See **Liu et al.**, col. 6 lines 1-48; col. 13 lines 35-60; figures 3, 4, 7, and 9] The same reasons for rejection, that apply to claim **11** also apply to **claim 18** and need not be reiterated.

28. With respect to **Claim 20**, **Liu et al.**, teaches "acquiring the non-phase encoded MR data from a series of discarded acquisitions played out **at least one of before and after** acquisition of the phase encoded MR data". [See **Liu et al.**, col. 13 lines 57-59; col. 10 lines 63-67; col. 7 line 26 through col. 13 line 67, and figure 9, where only central non-interfering data, acquired before or after the non-phase encoded data is used in image reconstruction when a sampling window /interval is not constant.] The same reasons for rejection, that apply to **claim 19** also apply to **claim 20** and need not be reiterated.

29. With respect to **Claim 21**, **Liu et al.**, teaches and/or shows "the phase encoded data includes one of 2D and 3D MR data" because 2D planar slice, or 3D volumetric slab images are produced. [See **Liu et al.**, col. 6 line 25-47] The same reasons for rejection, that apply to **claim 19** also apply to **claim 20** and need not be reiterated.

30. With respect to **Claim 23**, **Liu et al.**, teaches and/or shows "generating a set of amplitude correction values from the non-phase encoded MR data;" [See **Liu et al.**, col. 7 lines 32-37; col. 2 lines 46-49; and col. 8 lines 1-4 in combination with one another.] "arrange the set of amplitude correction values in a table dimensionally equivalent to a k-space of phase encoded MR data;" [See **Liu et al.**, figures 3, 7, col. 5 lines 43-55; col. 7 line 26 through col. 8 line 4.] "and modify each data point of k-space with a similarly

positioned amplitude correction value". [See **Liu et al.**, figures 3, 7, col. 5 lines 43-55; col. 7 line 26 through col. 8 line 4; col. 2 lines 46-49.] The same reasons for rejection, that apply to **claim 19** also apply to **claim 23** and need not be reiterated.

31. With respect to **Claim 24 Liu et al.**, teaches and/or shows "amplitude correcting acquired phased encoded MR data without increasing scan time". [See **Liu et al.**, col. 8 line 44 through col. 13 line 60; col. 6 line 1 through col. 8 line 4; and col. 3 lines 43-53 where the correction to the individual amplitudes occurs "as it is received" [See **Liu et al.**, col. 5 line 66 through col. 8 line 4] or "just after each data line of echoes is acquired". [See **Liu et al.**, col. 8 line 44 through col. 13 line 60; col. 6 line 1 through col. 8 line 4; and col. 3 lines 43-53] Therefore the overall scan time is the same, and the order of processing reduces the amount of processing memory required. The same reasons for rejection, that apply to **claim 19** also apply to **claim 24** and need not be reiterated.

32. With respect to **Claim 25**, **Liu et al.**, teaches and/or shows "carrying out a pre-scan of a subject" (i.e. a calibration scan]) "and acquire the non-phase encoded MR data after the pre-scan but before acquisition of the phase encoded MR data. [See **Liu et al.**, col. 10 lines 63-68; col. 12 line 40 through col. 13 line 60] The same reasons for rejection, that apply to **claim 19** also apply to **claim 25** and need not be reiterated.

33. With respect to **Claim 26**, **Liu et al.**, shows from the connection lines which connect the components of figure 1 that the "computer data signal" is "embodied in a carrier wave that is uploadable/downloadable to an MR imaging system." [See **Liu et al.**, figure 1.] The same reasons for rejection, that apply to **claim 19** also apply to **claim 26** and need not be reiterated.

34. **Claims 11-14, and 16-18** are rejected under **35 U.S.C. 102(b)** as being anticipated by **Sandford et al.,** US patent 5451876 issued September 19th 1995. This patent has an equivalent in German (i.e. DE 4436801 A1 published 20th April 1995).

35. With respect to **Claim 11**, **Sandford et al.**, teaches and shows "An MRI apparatus comprising: a magnetic resonance imaging (MRI) system having a plurality of gradient coils positioned about a bore of a magnet to impress a polarizing magnetic field and an RF transceiver system and an RF switch controlled by a pulse module to

transmit RF signals to an RF coil assembly to acquire MR images", [See **Sandford et al.**, figure 1, col. 1 line 1 through the entire detailed description] "and a computer" (i.e. computer system 107) "programmed to: (A) acquire at least one set of reference MR data;" (i.e. the MR data without phase encoding) "(B) determine a table of amplitude modulation correction values from the reference MR data;" [See **Sandford et al.**, col. 1 line 1 through the entire detailed description. The examiner notes that constructing a table of amplitude correction values is a main point of the entire reference.]

36. Additionally, the examiner notes that **Sandford et al.**, teaches that the receivers not only change the amplitude of the acquired NMR signal, but also the time delay imposed on the acquired NMR signal which must be normalized to remove smearing, blurring or the misplacement of spin signals along the readout gradient axis. [See **Sandford et al.**, col. 5 lines 25-32, where the correction of the "time delay" which removes smearing, blurring or the misplacement of spin signals along the readout gradient axis, is a "modulation correction", and the correction parameters "A" and (θ) stored in normalization table 225 are amplitude "A", "modulation correction" θ values. [See col. 5 line 25 through col. 8 line 11] The examiner also points out that the amplitude modulation corrections of applicant's specification remove smearing, blurring or the misplacement of spin signals, therefore the table of correction values "A", "θ" directly meet the requirements of the claim as supported by applicant's original disclosure in contrast to the arguments of the March 24th 2005 response.

37. The **Sandford et al.**, reference also teaches limitation "(C) acquire MR data;" [See col. 2 lines 12-15] "and (D) modify the acquired set of reference MR data by the table of amplitude modulation correction values". [See **Sandford et al.**, col. 1 line 1 through the entire detailed description. The examiner notes that constructing a table of amplitude correction values, and correcting the amplitude and time delays in order to remove the amplitude modulation problems of smearing, blurring or the misplacement of spin signals along the readout gradient axis is a main point of the entire reference.]

38. With respect to **Claim 12**, **Sandford et al.**, teaches "acquiring the at least one set of reference MR data from one or more discarded acquisitions played out one of

prior to and after acquisition of the MR data". [See **Sandford et al.**, Figure 4 and col. 6 line 60 through col. 8 line 11.] The same reasons for rejection, that apply to claim **11** also apply to **claim 12** and need not be reiterated.

39. With respect to **Claim 13**, **Sandford et al.**, teaches "acquiring portions of the at least one set of reference MR data prior to and after acquisition of the MR data". [See **Sandford et al.**, Figure 4 and col. 6 line 60 through col. 8 line 11.] The same reasons for rejection, that apply to claim **11** also apply to **claim 13** and need not be reiterated.

40. With respect to **Claim 14**, **Sandford et al.**, teaches that "the at least one set of reference MR data includes non-phase encoded data" [See **Sandford et al.**, col. 7 line 25 through col. 8 line 11 "The table of receiver attenuation values (RA used during the scan can be produced in a number of ways ..." through the end of the detailed description] **Sandford et al.**, teaches that "the MR acquired MR data is modified while in k-space" because the amplitude correction occurs prior to the Fourier Transformation which produces the final resulting image(s). [See the entire **Sandford et al.**, detailed description.] The examiner notes that any step which occurs prior to the image producing Fourier Transform occurs necessarily in the intrinsic k-space domain. The same reasons for rejection, that apply to claim **11** also apply to **claim 14** and need not be reiterated.

41. 16. With respect to **Claim 16**, **Sandford et al.**, teaches that "the RF coil assembly includes a phased array" (i.e. a plurality) "of receiver coils" [See **Sandford et al.**, col. 6 lines 55-59, which starts with the text "It should be apparent to those skilled in the art that when a plurality of receivers ... as with phase array receive coil. ..."] . The same reasons for rejection, that apply to claim **11** also apply to **claim 16** and need not be reiterated.

42. With respect to **Claim 17**, **Sandford et al.**, teaches that "the computer is further programmed to carry out acts (A)-(D) independently for each receiver coil" [See **Sandford et al.**, col. 4 lines 37-46 which starts with the text "Referring particularly to figures 1 and 2, ... the coils 152A, 152B may be separate as shown in fig. 2, ..." and col. 6 lines 55-59, that begins with "It should be apparent to those skilled in the art that when a plurality of receivers ... as with phase array receive coil. ..." through the end of

the detailed description]. The same reasons for rejection, that apply to **claims 11, 16** also apply to **claim 17** and need not be reiterated.

43. With respect to **Claim 18**, **Sandford et al.**, teaches generating "an image space from the modified MR data." [See **Sandford et al.**, col. 4 lines 47-63 which starts with the text "The received signal ..." detailed description paragraph 20 which starts with the text "Referring particularly to figure 4 ..." and detailed description paragraph 21 which starts with the text "After the prescan 230, and ..."]. The same reasons for rejection, that apply to claim **11** also apply to **claim 18** and need not be reiterated.

Claim Rejections - 35 USC § 103

44. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

45. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

46. **Claims 1, 9, 10, 15** are rejected under **35 U.S.C. 103(a)** as being unpatentable over **Sandford et al.,** US patent 5451876 issued September 19th 1995; in view of **Liu et al.,** US patent 5,621,321 issued April 15th 1997

47. With respect to **Claim 1**, **Sandford et al.,** teaches and shows "A method comprising the steps of: acquiring MR data from multiple echoes in an echo train with a pulse sequence;" [See **Sandford et al.**, col. 3 lines 42-58 the detailed description paragraph which starts with the text "a transceiver module 150 ...] **Sandford et al.,** also teaches and shows "correcting for amplitude modulation effects in the pulse sequence after data acquisition" [See **Sandford et al.,** col. 2 lines 3-52 and the entire detailed

description.] **Sandford et al.**, lacks directly teaching the use of "a fast spin echo pulse sequence." However, **Liu et al.** teaches "a fast spin echo pulse sequence." [See **Liu et al.,** col. 5 lines 4-10; col. 1 lines 6-16; Figures 1, 2, 5, 7, 8, and 9] Additionally **Liu et al.**, teaches correcting both amplitude and phase components throughout the reference, [See **Liu et al.**, col. 5 line 4 through col. 13 line 60], and like **Sandford et al.**, also teaches using a phased array of reception coils, and reconstructing each coils image components separately. [See **Liu et al.**, col. 13 lines 52-60 which automatically implies the presence of "more than 1 reception coil" by definition.] It would have been obvious to one of ordinary skill in the art at the time that the invention was made to modify the teaching of **Sandford et al.**, which corrects the amplitude modulations of a plurality of signals from one or a plurality of independent receiver coils, with the teaching of **Liu et al.**, which specifically teaches a fast-spin-echo pulse sequence when it is desirous to image and correct amplitudes rapidly, but with less memory requirements, allowing a faster signal acquisition because the ability to perform sequences and corrections faster makes the technique more versatile, and increases the chances of producing a resulting image which is free of motion artifacts in fast imaging situations such as cardiac imaging, or imaging conducted while a patient is holding his or her breath.

48. With respect to **Claim 9**, " **Sandford et al.**, teaches that "the MR data is acquired via multiple receiver coils, (i.e. a plurality) "of receiver coils" [See **Sandford et al.**, col. 6 lines 55-59 which starts with the text "It should be apparent to those skilled in the art that when a plurality of receivers ..."] "and further comprising the steps of correcting for amplitude modulation effects in the MR data from each receiver coil independently." [See the **Sandford et al.**, col. 6 lines 55-59] The same reasons for rejection, obviousness, and motivation to combine, that apply to **claim 1** also apply to **claim 9** and need not be reiterated.

49. With respect to **Claim 10**, **Sandford et al.**, teaches, "generating a combined image from corrected image data from each receiver coil." [See **Sandford et al.**, col. 4 lines 47-63; col. 6 line 60 through col. 7 line 24. See also the **Sandford et al.**, abstract where all the received corrected signals are used to reconstruct an image, and **Sandford et al.**, col. 6 lines 55-59 through col. 7 line 21 where a single image or a

plurality of images may be formed]. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 1, 9** also apply to **claim 10** and need not be reiterated.

50. With respect to **Claim 15**, **Sandford et al.**, lacks directly teaching "the computer is further programmed to acquire the MR data with a fast spin echo pulse sequence." However, **Liu et al.** teaches "a fast spin echo pulse sequence." [See **Liu et al.,** col. 5 lines 4-10; col. 1 lines 6-16; Figures 1, 2, 5, 7, 8, and 9] Additionally **Liu et al.**, teaches correcting both amplitude and phase components throughout the reference, [See **Liu et al.**, col. 5 line 4 through col. 13 line 60], and like **Sandford et al.**, also teaches using a phased array of reception coils, and reconstructing each coils image components separately. [See **Liu et al.**, col. 13 lines 52-60 which automatically implies the presence of "more than 1 reception coil" by definition.] It would have been obvious to one of ordinary skill in the art at the time that the invention was made to modify the teaching of **Sandford et al.**, which corrects the amplitude modulations of a plurality of signals from one or a plurality of independent receiver coils, with the teaching of **Liu et al.**, which specifically teaches a fast-spin-echo pulse sequence when it is desirous to image and correct amplitudes rapidly, but with less memory requirements, allowing a faster signal acquisition because the ability to perform sequences and corrections faster makes the technique more versatile, and increases the chances of producing a resulting image which is free of motion artifacts in fast imaging situations such as cardiac imaging, or imaging conducted while a patient is holding his or her breath. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claim 11,** also apply to **claim 15** and need not be reiterated.

51. The **prior art made of record** and not relied upon (i.e. See the attached PTO 892) is considered pertinent to applicant's disclosure.

A) **Kuhara** US patent 4,859,946 issued August 22nd 1989.

B) **Maier et al.,** German DE patent 4436801 A1 published 20th April 1995, which is equivalent to **Sandford et al.**, US patent 5451876 issued September 19th 1995.

C) **Zhang** US patent application publication 2003/0109781 A1 published June 12th 2003, filed December 11th 2001.

D) **Satoh** US patent 4,746,860 issued May 24th 1988.

E) **Ma et al.,** US patent 6,586,935 B1 issued July 1st 2003, filed May 31st 2000.

F) **Satoh** US patent 4,999,581 issued March 12th 1991.

G) **Zhou et al.,** US patent 6.064205 issued May 16th 2000.

H) **Zhou et al.,** US patent 5,923,168 issued July 13th 1999.

I) **Zhou et al.,** US patent 5,672,969 issued September 30th 1997.

Conclusion

52. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tiffany Fetzner whose telephone number is: (571) 272-2241. The examiner can normally be reached on Monday-Thursday from 7:00am to 4:30pm., and on alternate Friday's from 7:00am to 3:30pm.

53. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez, can be reached at (571) 272-2245. The **only official fax phone number** for the organization where this application or proceeding is assigned is **(703) 872-9306**.

Tiffany A. Fetzner

TAF
June 8, 2005

for Diego Gutierrez
Supervisory Patent Examiner
Technology Center 2800